Global Climate Change

Earth's Atmosphere

Our earth is surrounded by a blanket of gases called the atmosphere. Without this blanket, the earth would be so cold that almost nothing could live. It would be a frozen planet. Our atmosphere keeps us alive and warm.

The atmosphere is made up of many different gases. Most of the atmosphere (99 percent) is oxygen and nitrogen. The other one percent is a mixture of **greenhouse gases**. These greenhouse gases are mostly water vapor, mixed with carbon dioxide, methane, CFCs, ozone, and nitrous oxide.

Carbon dioxide is the gas that is produced as we breathe and when we burn wood and fossil fuels.

Methane is the main gas in natural gas—a fossil fuel. Methane is also produced when plants and animals decay.

The other greenhouse gases (ozone, CFCs and nitrous oxide) are produced when fuels are burned, as well as in manufactuing processes and in other ways.

Sunlight and the Atmosphere

Rays of sunlight (radiant energy) shine down on the earth every day. Some of these rays bounce off molecules in the atmosphere and are reflected back into space. Some rays are absorbed by molecules in the atmosphere and are turned into heat energy.

About half of the radiant energy passes through the atmosphere and reaches the earth. When the sunlight hits the earth, most of it is transformed into heat (thermal energy). The earth absorbs some of this heat energy. The rest of the heat flows back out toward the atmosphere. This outward flow keeps the earth from getting too warm.

When this heat energy reaches the atmosphere, most of it is absorbed. It can't pass through the atmosphere as readily as sunlight. Most of the heat becomes trapped and flows back again to the earth.

Most people think it's sunlight that heats the earth, but actually it's this heat energy that provides most of our warmth.

THE GREENHOUSE EFFECT

Radiant energy (white) shines on the earth.
Some radiant energy reaches the atmosphere and is reflected back into space.
Some radiant energy is absorbed by the atmosphere and is transformed into heat (black arrows).

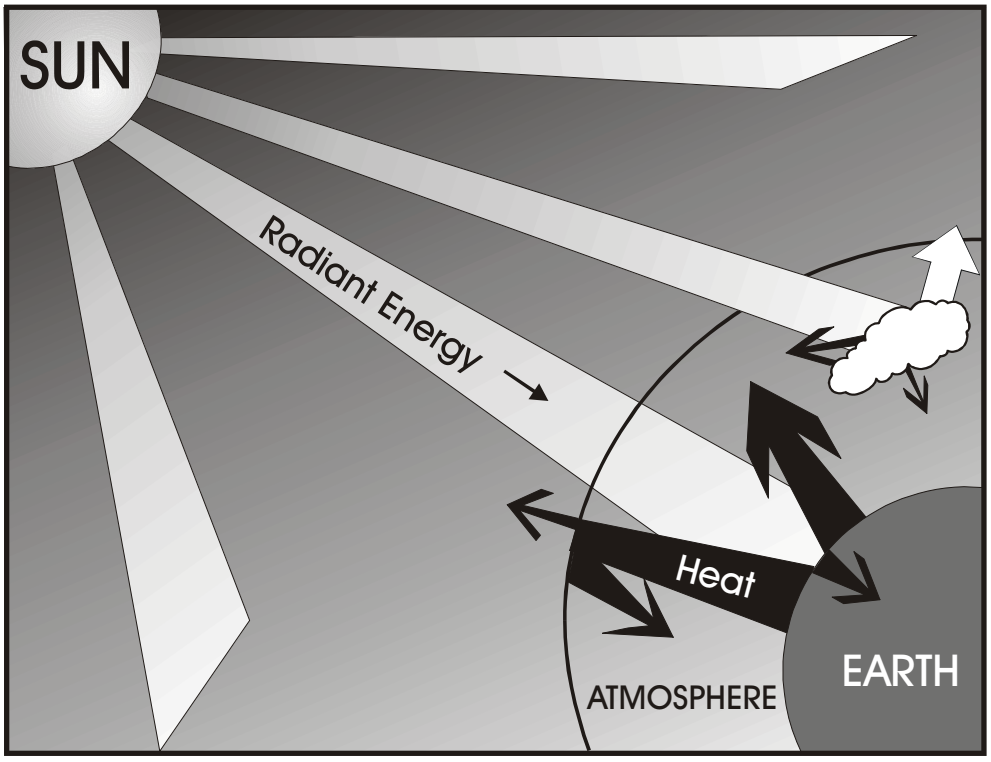
Half of the radiant energy that is directed at earth passes through the atmosphere and reaches the earth, where it is transformed into heat.

Some of this heat energy is absorbed by the earth.

Most of the heat energy flows back into the air. The atmosphere traps the heat energy.

Very little heat energy escapes back into space.

The trapped heat energy flows back to the earth.



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The Greenhouse Effect

We call this trapping of heat by the atmosphere the **greenhouse effect**. A greenhouse is a building made of clear glass or plastic in which we can grow plants in cold weather. The glass lets the sunlight pass through, where it turns into heat when it hits objects inside. The heat becomes trapped. The radiant energy can pass through the glass; the heat energy cannot.

What is in the atmosphere that lets light through, but traps heat? It's the greenhouse gases—mostly carbon dioxide and methane. These gases are very good at absorbing heat energy in the atmosphere, where it can flow back toward earth.

In the last 50 years, studies show that the level of some greenhouse gases—principally carbon dioxide and methane—has increased dramatically. There are more people on earth producing carbon dioxide by breathing and burning more and more fossil fuels and wood.

The level of methane in the atmosphere has also increased. Some methane escapes from coal mines and oil wells. Some is produced when plants and garbage decay. Some animals also produce methane gas.

Global Climate Change

Most scientists think greenhouse gases are trapping more heat in the atmosphere as their levels increase. They point to several studies that indicate that the average temperature of the atmosphere is beginning to rise. They call this phenomenon **global warming**. They believe that if the temperature of the earth rises just a few degrees Fahrenheit, it will cause major changes in the world's climate.

These scientists predict more floods in some places and droughts in others. They believe the level of the oceans might rise as the ice at the North and South Poles melts, causing low–lying coastal areas to become flooded. They predict more extreme weather, such as more powerful storms and hurricanes.

They believe that countries all over the world need to act now to lower the amount of carbon dioxide we put into the atmosphere. They believe we should reduce the amount of fossil fuels that we burn.

Some scientists are skeptical. They believe it is too soon to tell if there will be long-term changes in the global climate because of increased carbon dioxide in the atmosphere. They are not sure that slight global warming would be detrimental. They see some advantages to slight warming, such as longer growing seasons for crops, warmer nights, and milder winters.

These scientists think there should be more studies done before we decide to limit the use of fossil fuels, which they believe could cause major economic problems.

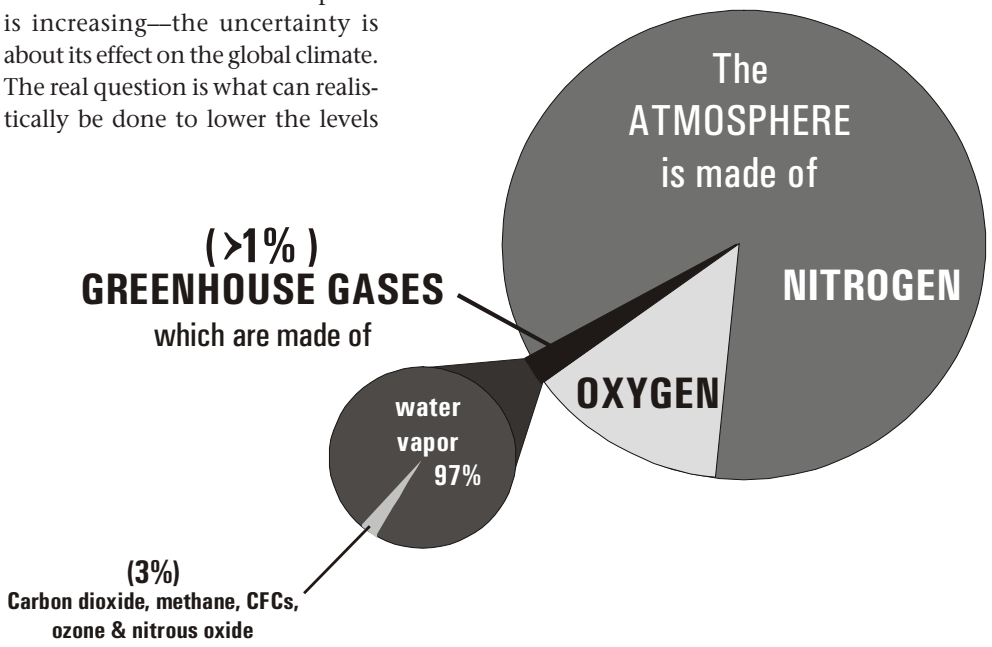
All scientists agree that the level of carbon dioxide in the atmosphere is increasing—the uncertainty is about its effect on the global climate. The real question is what can realistically be done to lower the levels of carbon dioxide in the atmosphere without causing major negative impact on the global economy.

Kyoto Protocol

In December 1997 in Kyoto, Japan, representatives from countries around the world agreed upon a landmark treaty to reduce greenhouse gas emissions.

In November 1998, the global community met again—this time in Buenos Aires, Argentina—to discuss implementation of the Kyoto Treaty. Representatives of more than 160 countries agreed upon deadlines and an action plan for implementing the treaty.

The Kyoto Treaty was officially signed by the United States on November 12, 1998, but still must be ratified by the U.S. Senate and signed by the president before it becomes law. President Bush has stated that he will not approve the treaty in its present form, because it does not include limits on emissions for developing countries such as China, which will soon surpass the United States as the world's leading emitter of greenhouse gases.



Greenhouse gases make up less than one percent of the atmosphere. Greenhouse gases are more than 97 percent water vapor.